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ELEMENTS OF EUROPE'S ENERGY UNION

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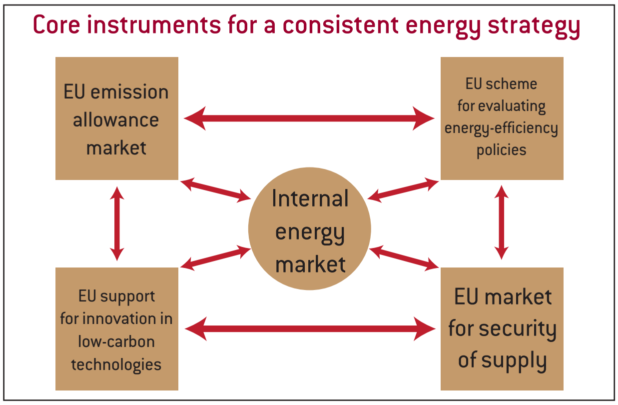
THE ISSUE European Union energy policy is guided by three objectives: sustainability, security of supply and competitiveness. To meet its goals in these areas, the EU is updating its energy strategy with new targets for 2030. The starting point for this is the assessment of the previous EU climate and energy package, at the centre of which were the 20-20-20 targets for 2020. Although the EU is largely on track to meet these targets, EU energy policy is generally not perceived as a success. Recent events have undermined some of the assumptions on which the 2020 package was built, and the policies for achieving the 2020 targets – although at first sight effective – are far from efficient.

POLICY CHALLENGE

To meet the EU's objectives for emissions, electricity supply and gas security of supply, well-designed European markets could provide better results at lower cost than uncoordinated national approaches. In other areas – such as energy efficiency and supporting innovation – markets alone might not be enough. Europe should thus rethink its quantitative headline targets for 2030. The proposed 40 percent decarbonisation target is in line with a stronger emission allowance market, but the target for renewables should be defined in terms of innovation rather than deployment, and the energy-efficiency target should be defined in terms of encouraged energy and cost savings, not the amount of energy consumed in a certain period.



Source: Bruegel.

THE EUROPEAN UNION IS LARGELY ON TRACK to meet the so-called 20-20-20 climate and energy targets[1], which were seen as quite ambitious when they were adopted in 2009. EU final energy consumption fell by 7 percent from 2005-11 (Figure 1), energy production from renewable sources increased by 4.2 percentage points from 2005-12 (Figure 1) and greenhouse gas emissions dropped by 13 percent in the same period (Figure 2). By 2012, emissions were already 19.2 percent below the 1990 level, leaving just a small gap before the EU meets the 20 percent reduction target for 2020[2].

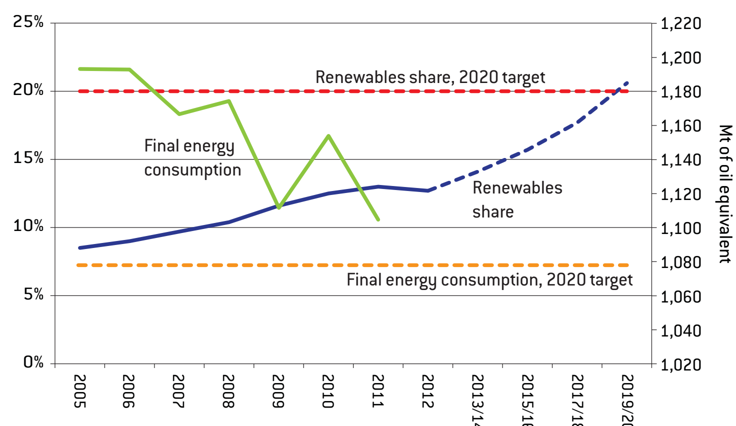
However, EU energy policy is generally not perceived as a success. Recent events have undermined some of the assumptions on which the 2020 package was built, and the policies for achieving the 2020 targets – although at first sight effective – are far from efficient.

In terms of supply security, the Ukraine crisis has shown that energy efficiency and increased deployment of renewables have been so far insufficient to eliminate Europe's reliance on Russian gas.

In terms of sustainability, other major emitters have not wholeheartedly followed the EU lead to cut emissions. New fossil energy resources make it more difficult to believe that such a global agreement is feasible because it would imply not using most of the fossil-fuel bounty. So the global impact of Europe's emission reductions will be close to insignificant, while Europe's decarbonisation strategy turned out less ambitious than originally claimed, because the recession (and some other factors) supplied much of the promised emissions reduction.

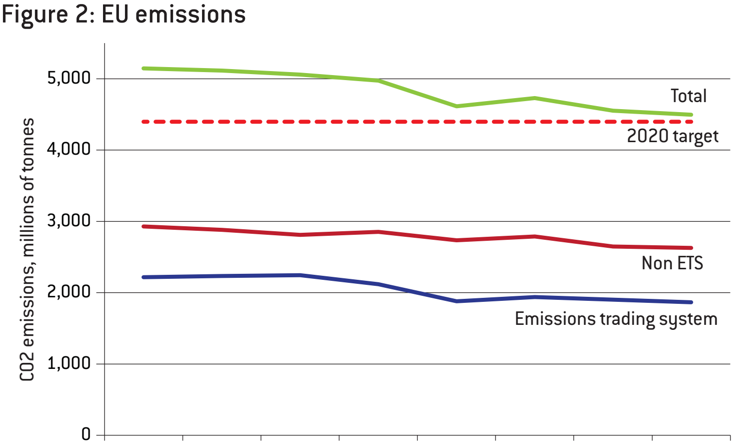
In terms of competitiveness, various developments have made the energy mix envisaged in 2008 relatively more expensive. The Fukushima accident resulted in the closure of cheap nuclear plants while increasing the already high cost of new nuclear. It also became clear that carbon capture and storage technology[3] is unlikely to become competitive any time soon relative to other low-carbon electricity generation technologies. Consequently, decarbonisation in Europe might have to rely even more on variable renewables, which is likely to drive up the cost of the transition. Meanwhile, the US shale gas boom caused a widening transatlantic energy price gap. All this happened during the EU's most severe economic crisis, and shifted the focus of policymakers from long-term industrial policy projects such as developing renewables, to defending the competitiveness of sectors such as energy-intensive steel plants.

Figure 1: Share of renewable energy in gross final energy consumption (%, left scale); EU energy efficiency (right scale)



Source: Bruegel based on Eurostat. The target value of 1,078 Mtoe for final energy consumption was set by Directive 2012/27/EU. Both target and actual consumption refer to EU27 (thus excluding Croatia). Dotted line for renewables = projection.

Figure 2: EU emissions



Source: Bruegel based on data from EEA (2013).

1. Energy efficiency target: 20 percent reduction in final energy consumption compared to projections; renewables target: 20 percent in gross final energy consumption; emissions target: 20 percent reduction compared to 1990.

2. http://www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2014.

3. Which would allow existing fossil-fuel plants to continue to operate by mitigating their emissions.

In addition, the 2020 climate and energy policies have inherent problems. Decarbonisation has been mainly delivered by a combination of economic downturn and renewables policy (CDC, 2014). Consequently, the EU emissions trading system (ETS) – which would have been able to identify much cheaper abatement options – was barely used. Furthermore, most investments in power plants, networks and consumption have been based on national remuneration schemes, undermining the internal energy market and failing to deliver a well-balanced European energy system that could support the climate and energy policy objectives.

Nevertheless, the EU package for 2020 was a valid hedging strategy in a world of scarce and expensive energy. It addressed the questions of its time, and could have been quite effective in a scenario that saw renewable energy quickly become indispensable in all parts of the world.

Now, European Commission proposals for 2030 foresee an emissions reduction of 40 percent and a 27 percent share of renewables (European Commission, 2014). There is also some momentum for a binding energy efficiency target that could be set at 30 percent. The differentiated increase in the three targets indicates a change in priorities:

- The 40 percent emissions reduction relative to 1990 is a compromise. It is an ambitious unilateral target as long as there is no global agreement. It provides a signal for low-carbon investment and allows the political decarbonisation instruments – such as emission trading – to be boosted without excessive cost. It therefore keeps the door to a more aggressive decarbonisation policy open, should other major economies join the battle. But the target is less than optimal to deliver Europe's share of the global 2050 objective[4].
- The 27 percent renewables target is essentially insignificant[5]. Its main justification is to form the legal basis for national renewable support schemes that might otherwise be challenged for undermining the internal energy market.
- A 30 percent energy efficiency target would be an acknowledgement of the importance of efficiency to achieve the energy policy objectives. But the case for the chosen metric and the corresponding number is weaker than that for the other two targets.

The proposed quantitative targets testify to the prioritisation within EU energy policy – 40-30-27 instead of 20-20-20 – but are not a consistent strategy to respond to the changing energy policy challenges[6]. The strategic task is to translate the prioritisation of objectives and the interaction between instruments into a consistent policy framework.

From a strategic perspective, it is important to note that it is impossible to determine which menu of investments is most conducive to achieve security of supply, sustainability and competitiveness of energy supply. So the main role of policy is to develop reliable frameworks that will encourage the investment that will enable stable energy services at the lowest direct and external cost.

A well-functioning internal energy market is the core of such a framework, complemented by an equally well-functioning European market for emission allowances and a market for supply security. Europe also needs an ambitious framework to speed up low-carbon innovation. The final element is a system to make energy efficiency policies at different levels of government comparable in order to come up with the best mix.

REVAMPING THE MARKET

A functioning internal energy market in which companies and technologies freely compete to provide the best services at the lowest price, while respecting societal and environmental constraints, could be hugely welfare enhancing. Despite three EU legal packages, neither the provisioning of gas nor of electricity is organised in such markets. In electricity, the attempt to create a European market by coupling national day-ahead markets proved only partially successful. While national prices have somewhat converged, no internal electricity market has developed because important parts of the electricity sector are still subject to widely differing national rules and arrangements[7]. Investment decisions in the electricity sector are thus based on national policies, not European markets. This non-cooperation is costly, and the corresponding welfare loss is set

4. To have a fair chance of keeping global warming to no more than 2 degrees Celsius, global emissions would have to decline by about 60 percent by 2050; which translates into 80 to 95 percent by 2050 for industrialised countries (IPCC, 2007).

5. According to the Commission's impact assessment, a 40 percent emissions cut automatically implies a 27 percent renewable energy share in 2030.

6. For example, increasing the share of certain expensive, variable renewables could help to meet the target while it has only adverse effects on competitiveness and supply security without implying any emission reduction.

7. Consumers are faced with nationally regulated tariffs. Electricity transmission is organised nationally. Capacity mechanisms and renewables support schemes are organised nationally, and corresponding services are not tradable across borders.

to increase with the rising shares of renewables in the power system[8].

A European electricity market will not spontaneously evolve based on the enforcement of some first principles. Functioning electricity markets need to be designed: products need to be defined and schemes for their remuneration need to be engineered. An efficient market design needs to include all parts of the relevant system. It must ensure efficient incentives for trade-offs such as demand response versus storage, transmission lines versus decentralised generation or solar versus lignite. And to be efficient, this design needs to be European.

The first step is to ensure that national energy regulations are not used for domestic industrial or social policy. Regulated final consumer tariffs in France below what the market would offer, the same electricity price in south and north Germany despite a lack of interconnection, or paying premiums to domestic plants – which is essentially what capacity mechanisms and renewables support schemes do – are all inconsistent with a functioning internal market.

This implies that the fuel mix prerogative of the member states should be restricted to preferences against certain technologies, such as 'no nuclear in Germany' or 'no shale gas in France'. While restricting certain technologies, if done transparently and predictably, would be consistent with a functioning European market, there can be no European market if member states prescribe certain fuel mixes, such as 'more than 40 percent of electricity from German renewables in Germany' or 'more than 80 percent of Polish electricity from Polish coal'.

Given the substantial distributive effects[9], a European energy market requires accountable governance. Market designs need to be regularly adapted to changing circumstances, so the governance structure needs to be institutionalised. But, the European Commission has neither been given the authority to strike a deal between vested interests, nor does it possess the manpower for such a complex task[10]. Consequently, the Commission relies on selected stakeholders to negotiate compromises over individual issues[11].

'A European energy market requires accountable governance and curtailing of the role of national energy policymaking.'

To develop a truly functioning internal market, the Commission needs to prepare a fourth legal package outlining the European energy market framework. This should not shy away from curtailing the role of national energy policymaking. It should propose one or several generic market designs. The European Parliament and Council should then decide which of those generic designs should be developed further. Because of the complexity, the substantial information asymmetries between stakeholders and the significant redistributive effects, this task of developing a market model should be entrusted to a well-staffed and accountable institution that will also be responsible for the ongoing implementation of the design[12] – for example, the Agency for the Cooperation of European Regulators (ACER). This would, however, require resources matching its responsibility[13] and an overhaul of the decision-making process. The final design would then be ratified by the European Parliament and Council.

Creating a functioning internal energy market would be a major shift that will not be achieved through smooth convergence of national markets. The alternative would be to return to a system of more-or-less managed national electricity systems – with some unreliable cross-border exchanges of energy. This would not only make the systems less efficient. It will also make national security of supply more costly, and deployment of renewables beyond a certain level prohibitively expensive.

RE-ESTABLISHING THE ETS

The ETS covers most carbon-emitting industries and will run indefinitely, with a shrinking annual supply of allowances. It is an effective and efficient tool to mitigate emissions[14].

But, the price of ETS allowances has collapsed because of an oversupply[15] and the undermining of the system's credibility. The risk in these developments is that the ETS gets replaced by less-efficient national, sectoral and

8. Zachmann (2013b) shows that in a highly stylised scenario with high shares of renewables, moving from individually optimised power plant fleets in Spain and Germany towards a jointly optimised power plant fleet could save seven percent of the total cost of electricity.

9. Even minor technical harmonisation (such as adjusting the gate-closure times for reserving transmission capacity) have distributive effects. More structural decisions over renewable support schemes or capacity mechanisms might easily shift billions of euros between countries, between producers and consumers and between different producers.

10. The energy market is much more complex and sizeable than the ETS (Electricity represents about 2 percent of EU GDP, while emission allowances represent about one tenth of a percent.)

11. One prominent example, is the development of 'network codes' that should ensure sufficient harmonisation of national market rules.

time-inconsistent measures. A revamp is therefore important to incentivise the use of current low-carbon alternatives (for example burning gas instead of coal) and to ensure low-carbon investment.

The European Commission proposal to revamp the ETS is (1) to increase the speed by which the annual allocation of allowances are curtailed from 1.74 percent to 2.2 percent every year after 2020[17] and (2) to introduce a 'market stability reserve' through which any surplus of allowances above a certain level will be removed from the market, and reintroduced when the surplus falls below a certain level.

Steeper reduction of annual allowance allocations after 2020 is a sensible step to ensure that Europe plays its part in the containment of global warming. There is however a risk that the sectors covered by the ETS could fall out of step with the emission reductions in sectors that do not fall under the ETS, such as transport and heating. For example, electricity for electric vehicles and heat pumps falls under the ETS, while combustion-engine cars and oil heating do not. The most elegant solution to avoid different carbon prices for different technologies would be to extend the scope of the ETS to all relevant sectors[18].

The Commission's proposed 'market stability reserve' is intended to avoid politically motivated intervention in the market. But the use and workability of such a mechanism are highly disputed[19].

A more promising way to effectively shield the ETS from political interference would be to ensure that future policymakers that decide to undermine the ETS have to compensate companies that invested based on the claims made by policymakers today that the ETS is stable.

This could be organised through private contracts between low-carbon investors and the public sector. A public bank could offer contracts that will pay in the future any positive difference between the actual carbon price and a target level[20]. Low-carbon investors would bid to acquire such contracts to hedge their investments. This would produce three benefits. First, the public bank would be able to collect money upfront (a sort of insurance premium) and make a profit if a sufficiently tight climate policy is maintained. Second, the private investor significantly reduces its exposure to the – political – carbon market and hence accepts longer pay-back times for its investments. This would unlock long-term investment that is currently too risky. Third and most importantly, public budgets would be significantly exposed to the functioning of the ETS. If future policymakers take decisions that increase the number of available allowances, they might be called back by their treasuries because this would activate the guarantees pledged to investors. This would serve as a much more credible commitment to preserve the integrity of the ETS.

'Security of gas supply is about maintaining unused alternatives that can be tapped into.'

SUPPLY SECURITY

The EU's perceived vulnerability to a reduction in gas (and oil) supplies from Russia in the context of the Ukrainian crisis has put supply security back on the agenda[21].

Security of gas supply is not primarily about reducing import dependency or increasing Europe's negotiating power with foreign suppliers. Rather, it is about maintaining unused alternatives that could be tapped into for an indefinite period in case the most important supplier fails for technical or political reasons.

There is a long-standing debate about whether completing the internal market will deliver supply security. A functioning internal market offers the most efficient rationing mechanism during crises and market-based long-term prices in Europe ensure that suppliers have the right incentives to develop new sources. On the other hand, the market – which typically goes for the cheapest available source – might fail to sufficiently diversify. For example, the current market design will not provide infrastructure to connect sources that are in normal circumstances uncompetitive, but which serve as insurance in case the cheapest supplies become unavailable.

But managed approaches, such as providing security via public investment in certain infrastructure, could crowd out private

12. Delegating powers to community agencies faces legal constraints ('Meroni Doctrine') which have been discussed in the context of the institutions of the 'Banking Union'.

13. In addition to increasing the manpower, resources should also include open models of the European energy system in order to have a common basis of discussion.

14. See Zachmann (2013a).

15. Between 2008 and 2012, about 2 billion of the 10 billion issued allowances were not used because of the recession (500 million), inflow of international carbon credits (1420 million), exceptional allowances allocated in 2012-13 (500 million), replacement of fossil plants by publicly supported renewables (200 million) and energy efficiency measures (150 million).

16. The percentage values (1.74 percent and 2.2 percent) refer to the average total quantity of allowances issued annually in 2008-2012. That is the

absolute annual reduction will increase from 38,264,246 today to 48,380,081 after 2020.

17. Introducing the steeper reduction factor would encourage saving some additional 150 million tonnes of CO2 before 2020 and reduce the overall allocation by 1.5 billion tonnes of CO2 by 2050.

18. For practical reasons this cannot be done directly (ie not every car should fall under the ETS), but through indirect measures such as an emission-price related fuel tax component.

19. The Commission itself states that the potential impacts of this mechanism on the carbon price cannot be modelled (CDC Climat Research, 2014)

20. The 'target level', the exercise year and the volume would be the result of a political compromise.

21. Supply security encompasses the resilience of the technical system (eg no blackouts) and the ability of Europe to ensure stable energy supplies despite foreign shocks. Given that technical supply security should

investment if not properly shielded from the market. If, for example, Europe financially supports a pipeline from Turkmenistan, the business case for the corresponding volume from the Levant region might disappear. Furthermore, national managed approaches regularly fail to select the most efficient options (eg demand curtailment, storage, LNG plants, pipelines, domestic production, domestic fuels).

So neither the current market design nor *ad-hoc* managed approaches appear well suited to efficiently ensure gas supply security. We therefore propose a market for 'reserve supplies'. Each domestic gas supplier would be legally required to maintain a certain amount of alternative supply, such as 20 percent of the contracted energy demand for three years. Suppliers can meet their obligation through different options such as (i) interruptible contracts with their consumers, (ii) volumes in storage, or (iii) option contracts with other domestic and foreign suppliers. Europe's suppliers would need to make sure that the transport capacities – pipelines and terminals – needed to deliver the corresponding volumes to customers are available. Furthermore, 'reserve supplies' could not be met by options involving pivotal suppliers/infrastructure. That is, holding an option for additional supplies from Russia would not qualify as 'reserve supplies'. To ensure this, pivotal suppliers/infrastructure will have to be identified. In case a supplier finds itself in a situation in which all existing infrastructure is either already used or pivotal, it will have to invest in new infrastructure. Suppliers would only be able to draw on these 'reserve supplies' in security crises following an official declaration. This system, the cost of which the domestic suppliers will largely pass through to their customers, should ensure security of supply for all at lowest cost and without undermining the internal market.

Such an approach would obviously have distributive effects. Consumers in well-connected regions that face a very limited risk of supply disruptions will have to pay for 'their' share of reserves, which most likely only their less well-connected neighbours might need. But this solidarity will not wash away regional differences arising from different infrastructure endowments because suppliers in areas with less-developed infrastructure will find it more costly to ensure the level of supply security. This is efficient because it provides an incentive against locating the most vulnerable sectors in vulnerable markets. For example, a chemical plant in Cyprus will only get an interruptible contract because no supplier could affordably secure the required reserve capacities.

RES-INNOVATION TARGET

Since the EU 20 percent target for renewables was decided, some of the reasons for investing in renewables have become less urgent. There is less risk that fossil fuels will run out quickly, more reliable suppliers are entering the global energy market[22] and a global agreement to mitigate greenhouse gases seems distant. Nevertheless, in the longer-term, issues such as dependence on imports from uncertain sources and rising hydrocarbon costs will return. Most importantly, affordable decarbonisation of the energy sector will require competitive renewable energy sources (RES).

Consequently, the focus of renewables support should shift from a deployment target that encourages the quick roll-out of the cheapest currently renewable technology, to an ambitious innovation target that encourages investment to cut the cost of RES. If successful, an innovation target will be the largest possible contribution of Europe (and its partners) to saving the global climate, and might be instrumental in developing a competitive edge in what will become a major global market[23].

It is difficult to establish the optimal size, selection, balance and timing of 'push' and 'pull' measures – for example, public R&D support, or feed-in tariffs to create demand for a new technology. Zachmann *et al* (2014) indicate that both public support to boost innovation and the timing of instruments matters. It is not massive actual deployment[24], but the prospect of deployment that is the carrot for industry to commercialise the technologies developed through publicly-supported R&D. A long-term deployment target – such as the 20 percent for 2020 – is helpful, not least because it incentivises innovation and investment in complementary technologies such as storage or networks. However, the deployment target should be broken down to technology-specific targets and developed as part of an innovation policy that optimally supports a broad portfolio of technologies at different stages of maturity. A revised Strategic Energy Technology Plan[25] could form the basis for defining measures and allocating support to technologies.

The current and envisaged renewables policies are not focused on innovation. Europe currently spends on relevant R&D about a hundredth of what it spends on renewables deployment (Figure 3)[26]. It does not integrate its deployment and R&D policies into a strategic innovation policy and does not coordinate its deployment policies across borders.

ENERGY EFFICIENCY

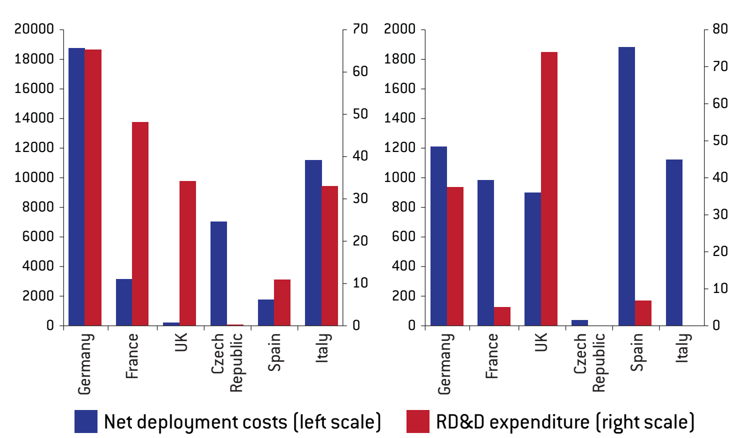
The key tool to ensure efficient energy usage is confronting all users with market-based price signals. Wasteful usage does not only refer to using more energy to produce a certain good, but also artificially maintaining a specialisation in energy-intensive goods. As Europe should not strive to subsidise labour costs to make the European textile industry competitive with Asia, Europe should not subsidise energy costs to make European aluminium production competitive with the US, especially as defending energy-intensive sectors at all cost locks in high energy consumption and implies that Europe needs to draw on more expensive supplies for all other sectors.

Beyond the issue of prices, the question is if energy efficiency needs to be regulated and if this should be done at European level. The need for regulation is often deduced from the finding that even efficiency measures with positive net present values are not delivered by the market[27]. As energy efficiency is an issue in virtually all sectors, there is a myriad of existing and proposed measures. So, energy efficiency policies can be welfare enhancing, but their efficiency depends on their design.

The same holds for the question of subsidiarity. The obvious argument for a European energy efficiency policy is its interdependence with the single market. National product energy-efficiency standards, national energy-efficiency schemes for energy companies or even distorting energy taxes could weigh on the single market's integrity. On the other hand, national regulatory environments and structures for important energy consuming sectors (eg buildings) differ markedly. This might make a one-size-fits-all European energy efficiency policy very inefficient in these fields.

So the somewhat generic conclusion on energy efficiency is that individual market failures should be addressed by the most efficient measures at the right level of government. For the broad portfolio of regional, national and European policies that is necessary, a binding EU 2030 energy consumption target is not well suited. It neither addresses who has to deliver nor does it properly take economic developments into account. To benchmark energy-efficiency policies we would suggest a bottom-up approach. Based on the ex-post evaluation of each individual energy efficiency policy, the incentivised demand reduction and the corresponding policy cost should be reported. For example, the energy-efficiency loans in Germany in 2011 had an estimated cost of about €1 billion and encouraged annual savings of 0.1 million tonnes of oil equivalent (Mtoe).

Figure 3: Deployment versus RD&D expenditure for solar (left panel) and wind (right panel) in 2010 in six EU countries (€ millions)



Source: Bruegel based on IEA and Datastream. Note: Net deployment costs are calculated as the difference between the deployment costs and the net present value of the future electricity generated. RD&D = research, development and demonstration.

be safeguarded by the market design and that Europe imports more than half of its energy needs , we focus on the later.

22. For example, liquefied natural gas exports from the US and Australia.

23. Primary consumption of oil, natural gas and coal amounts to about 6 percent of global GDP. Adding the value of existing non-fossil electricity production (about $2 trillion), energy downstream cost and demand side appliances, it is likely that a global market for new energy technologies would amount to more than 10 percent of world GDP.

24. Over-generous support in fact appears to reduce producers' incentives to aggressively compete on innovation. The ten largest solar panel producers all spend below 5 percent on R&D, compared to 10-20 percent in the semiconductors sector (www.pvtech.org/friday_focus/friday_focus_rd_spending_analysis_of_top_10_pv_module_manufacturers).

25. For example Zachmann *et al* (2012) and Ruester *et al* (2013).

26. Public spending on deployment has been

Two targets would then serve to benchmark the success of the overall policy framework up to 2030: one for total incentivised energy savings (eg more than 400 Mtoe of induced energy savings between 2020 and 2030) and one for total energy efficiency policy cost (eg less than €100 billion). This target might be broken down by member state (or even to sub-national level) and even made binding.

CONCLUSION

Policy and market failures in the energy sector are common. There is too little energy saving, too little investment in security and innovation and emissions are too high. Governments tend to over-invest in big supply projects and use energy-sector regulation for other national policy purposes, preferring to solve the issues of the day instead of addressing the structural problems.

The European 2030 framework should strive to address the market failures without falling for the government failures. Essential elements will be well-designed European markets for emissions, electricity supply and gas security of supply. Better policy frameworks are also needed to encourage energy efficiency and innovation in low-carbon energy technologies.

This would be a radical step-change in European energy and climate policy, but so were the 2020 targets. But in planning for 2030, Europe cannot avoid substantially revising the governance of its energy sector, without compromising on security of supply, sustainability and competitiveness.

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two orders of magnitude larger (in 2010 about €48 billion in the five largest EU countries in 2010) than spending on RD&D support (about €315 million).

27. Reasons discussed are myopic preferences of consumers or split incentives (eg between landlords and tenants). See for example Kolev *et al* (2012).

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